



# Durable Aircraft

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# DURABLE AIRCRAFT CONCEPT

## Vision

- Develop galvanic management technologies and engineered systems that eliminate fleet maintenance and reduce life-cycle corrosion costs of aircraft.

## Major Focus Areas

- Integrated Structural and Corrosion Design Tool
- Tests for Prototyping Corrosion
- Engineered Interfaces and Materials



***Requires a Radical Shift in Design Philosophy***

# INTEGRATED STRUCTURAL AND CORROSION DESIGN TOOL

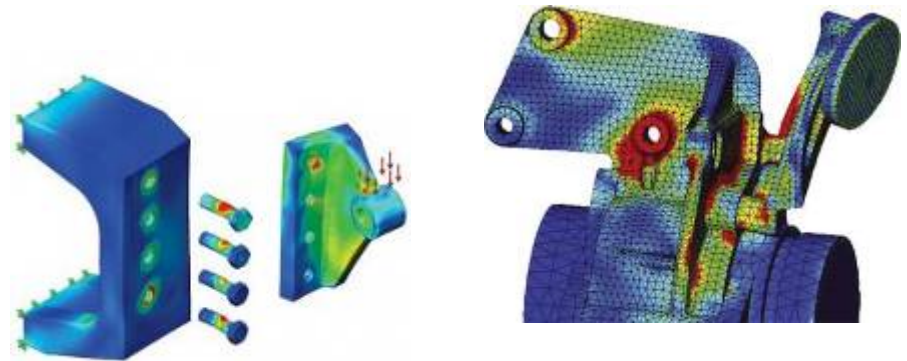
Innovative technologies that enable the modeling, simulation and validation of galvanic stress

Investment Technologies (TRL 2):

- Surface Corrosion Science
- Aircraft model of galvanic stress
- Engineering-design tool development

Vision of Galvanic Modeling Tool:  
Mapping Galvanic Stress Areas

- Electric Potential Drives Corrosion
- Factors
  - EM Environment
  - Weather / Op Environment
  - Dissimilar Materials
  - Stress
  - Design
  - Coatings
  - Material Degradation



$$\Delta V = \Delta V^o - \frac{RT}{nF} \ln \frac{[M_1^{n+}]}{[M_2^{n+}]}$$

Technology solutions will focus on F/A-18, H-60, E-2, H-53 a/c and future platforms - N-UCAS, F/A-XX.

- Highest cost drivers by platform and need
- Build upon initial work done by NRL for ships

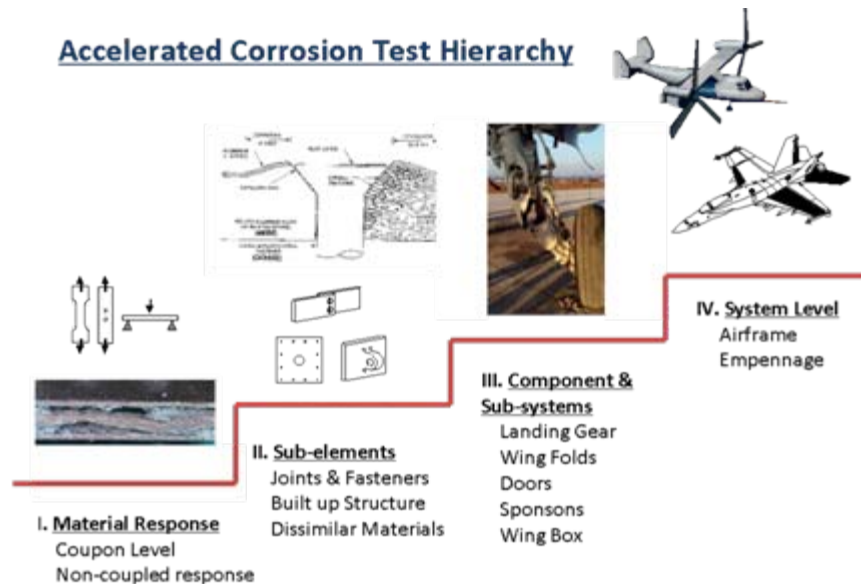
## TESTS FOR PROTOTYPING CORROSION

Innovative test technologies enabling prototyping  
and risk reduction for airframe corrosion performance at sea

Investment Technologies (TRL 2):

- Test and validation process
- Prototyping standard
- Advanced trade study method

- Government- Industry Accepted
- Validate Corrosion Response
- Realistic and Reliable
- Enables credible design AoA
- Enforceable Contract Language
- Design validation via DT
- Provides Answers
  - How much will it cost/save?
  - How long will it last?
  - What is the ROI?



Technology solutions will focus on F/A-18, H-60, E-2, H-53 a/c and future platforms - N-UCAS, F/A-XX.

- Highest cost drivers by platform and need
- Build upon work underway funded by SERDP

## ENGINEERED INTERFACES AND MATERIALS

Develop new technologies that reduce galvanic potential between materials used on airframe

Investment Technologies (TRL 2):

- Carbon fiber composites with reduced cathode area and less noble open circuit potential
- Multi-compatible fasteners and conductive coatings/sealants
- Galvanically tuned protective coatings



Technology solutions will focus on F/A-18, H-60, E-2, H-53 a/c and future platforms - N-UCAS, F/A-XX.

- Highest cost drivers by platform and need
- Multiple possible solutions

## Summary

- Corrosion is responsible for reduced safety, reduced mission capable assets, increased FRC workload, and increased logistics trail
- \$3B per year is spent on Navy-Marine Corp aircraft corrosion maintenance, i.e., 7.5% of NAVAIR's Budget
  - Airframe corrosion is approximately 86% of total
  - Galvanic damage at holes and other interfaces is bulk of structural damage
- Goals for each thrust
  - Design tool: improved materials selection and structural life prediction
  - Prototyping: validation of new materials and designs before they are fielded on full aircraft
  - Interfaces: new materials and processes which reduce galvanic corrosion and loss of structural life due to environmental effects

